

DEVELOPING RESPONSIVE INDICATORS FOR THE INDIAN BIOSPHERE RESERVE PROGRAMME

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Biosphere Reserves (BRs) are intended to reconcile challenges relating to conservation and sustainable use of biodiversity, social and economic development and maintenance of associated cultural values. In keeping with these objectives, India has established a network of 11 Biosphere Reserves. The study attempts to evaluate the performance of these BRs using a set of indicators relating to community participation, legal and institutional mechanisms, management capacity and effectiveness. The specific indicators relate to the Indian context and give special attention to issues like people-wildlife conflict, understanding of programme objectives at various hierarchical levels, continuance of traditional conservation practices and promotion of scientific research. Indian BRs have, by and large, failed to resolve or even added to resource conflicts due to inter agency disputes or imposition of an inappropriate model of development. Moreover, major management decisions seem to be taken at higher bureaucratic levels without reference to livelihood concerns of local people and traditional resource management systems followed in local areas. On the other hand, Indian BRs have been successful in areas like supplementary income generation. The study also points to a methodology of using 'discriminatory' performance indicators which would be adequately sensitive to the proximate needs of ecologically handicapped communities.

INTRODUCTION

Biosphere Reserves are intended to reconcile challenges relating to conservation and sustainable use of biodiversity, social and economic development and maintenance of associated cultural values (UNESCO 1996). In keeping with these objectives, India has established a network of eleven Biosphere Reserves till October 1999. Out of these eleven, only three — Nilgiri, Gulf of Mannar and Sundarban — are recognised under UNESCO's Man and Biosphere programme as of May 17, 2002 (<http://www.unesco.org/mab/brlist.htm>). The present study attempts to evaluate the performance of these Reserves, using a set of indicators relating to community involvement and participation, legal and regulatory mechanisms,

management capacity and effectiveness, drawing from a number of case studies.

The idea of Biosphere Reserves was mooted by UNESCO in 1973-74 under its Man and Biosphere (MAB) programme. Biosphere Reserve (BR) is an international designation coined by UNESCO for representative parts of natural and cultural landscapes extending over terrestrial or coastal/marine ecosystems. In India, BR is not a legal conservation category, unlike Wildlife Sanctuaries and National Parks. However, areas earmarked as BRs often overlap with areas which are legally protected, often resulting in conflicting plans and programmes.

MATERIAL AND METHODS

Field experience

One of the authors (MG) has been associated with the Indian Biosphere Reserve Programme since its early beginnings in 1980. At that time, he was commissioned by the Government of India to prepare the project document for the

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establishment of the Nilgiri BR. This subsequently became the first biosphere reserve to be established in 1986. The Centre for Ecological Sciences established a Field Research Station in the Nilgiri BR in that year and has been continually involved in monitoring the functioning of that BR since its inception. In 1992, the Ministry of Environment and Forests (MoEF), Government of India commissioned the Centre for Ecological Sciences (CES), Indian Institute of Science, Bangalore in 1992 to undertake a mid-term review of the Biosphere Reserve Programme. As a part of this exercise, Madhav Gadgil and R. Prabhakar undertook a specific review of the Nilgiri BR and Niraj Joshi undertook field visits to the following Biosphere reserves: Gulf of Mannar, Nandadevi, Nilgiri, Nokrek, Manas and Sundarban. This mid-term review was followed in 1993 by a training programme for the managers of the biosphere reserves in India at Mudumalai Wildlife Sanctuary in Nilgiri BR, which provided an opportunity for obtaining further inputs on the BR programme. Hans Raj Negi of CES conducted extensive field research in the Nandadevi BR during the years 1994 to 1997.

Subsequently, the Biosphere Reserve Programme was once again reviewed by CES in collaboration with RANWA, an environmental group, in 1996-98 as a part of the Biodiversity Conservation Prioritisation Programme (BCPP) of WWF-India. Under this programme, collaborative field visits were undertaken in the following Biosphere Reserves:

Biosphere Reserve	Collaborator
1) Gulf of Mannar	Winfred Thomas, American College, Madurai, Tamil Nadu
2) Nandadevi	Omprakash Bhatt, Dasholi Gramswarajya Mandal, Chamoli, Uttaranchal
3) Nokrek	Nature's Beckon, Dhubri, Assam
4) Manas	Nature's Beckon, Dhubri, Assam
5) Sundarban	Silanjan Bhattacharyya, Kolkata, West Bengal

The data collection has involved interviews with forest and other government officials, local people, researchers, and NGOs working in the area. Several field visits were conducted for rapid assessment of the various components of the BR programmes at various Biosphere Reserves by one of the authors or by the collaborators mentioned earlier. Secondary information sources in the form of reports, newspaper articles and official documents were also referred to.

Evaluation methodology

Of late, there has been a proliferation of literature on the evaluation of developmental interventions. The World Bank, World Resources Institute, IUCN and Biodiversity Support Program of WWF, for example, provide detailed guidelines on the kind of scientific and economic indicators which may be used to evaluate the performance of a wide range of projects. These range from country-specific biodiversity indicators like percentage of major forest types covered in a protected area network, as suggested by IUCN, to broader region-oriented measures like change in institutional or management structures leading to change in resource utilisation practices. These indicators have been extensively applied to assess the efficacy of funds provided at the international level, both by specialised funding mechanisms like the Global Environment Facility (GEF) and by bilateral donor organisations and aid agencies like DANIDA and NORAD. Of late, there is also a tendency to use indicators sensitive to equity concerns, specifically from the angles of gender and socially/economically disadvantaged communities.

At the same time, there has also been a major development in the economic and socio-political theory in the area of cost-benefit analysis and broader evaluation techniques. The major landmark in this regard would be the development of the Guidelines for Project Evaluation by UNIDO, Vienna (Dasgupta *et al.* 1972). These guidelines spell out the economic rationale behind

project choice, evaluation and monitoring using models of uncertainty and social choice. From then onwards, there has been a rapid growth of understanding on the valuation of ecosystem functions (Barbier 1992, Dixon 1992) and the social consequences of disruptions of such functions (Ruitenbeek 1992, Munasinghe 1990). Also, one school of economists, pioneered by Amartya Sen, have emphasised the use of discriminatory analytical tools like weighted indices of human development to assess programme level interventions, since indices which are aggregative or even relative at an inappropriate scale tend to suppress major equity and (re)distribution concerns. In his recent work *DEVELOPMENT AS FREEDOM*, Sen (2000) advocates the use of analytical tools that view development as a process of expanding substantive freedoms, reflected in socio-economic arrangements (e.g. health and educational facilities) and political/civil rights (e.g. the freedom to participate in public discussion and scrutiny). Performance evaluation of development interventions, when informed by such a view, involves active consideration of the ability of an intervention to achieve tangible enhancements in freedoms of the target groups, such as increased capacities of individuals and groups to indulge in public debate on issues that affect their livelihoods and lifestyles.

There is clearly a need to harmonise these two streams of literature in order to develop a set of responsive indicators for evaluation of interventions at project and programme levels. We make here a distinction between project and programme levels because project interventions very often follow from strategies developed at the programme level. Thus, reasons for success or failure of a specific project could lie both in problems intrinsic to the project itself or be the result of incorrect strategisation or poor learning at a higher decision-making level which gets reflected in project implementation phases. In this paper, our focus is on the use of indicators to make a programme level evaluation of the

Biosphere Reserve programme, as implemented in India.

These indicators should, on the one hand, test the efficiency of financial, technical and management inputs provided in terms of a set of carefully designed criteria, and on the other hand be adaptive enough to ground realities so as not to miss out relevant equity and social justice concerns. These concerns are almost always region and culture specific and, therefore, difficult to aggregate over projects. For example, increase in human-tiger conflicts in the Sundarban BR area — and the resultant agony of local communities — is now a part of local cultural ethos or even the mindscape of local communities. It is impossible to weigh this against reduced conflicts in other areas or offset positive economic indicators against the psychological cost of loss of a family member or living a differently-abled life.

The currently adopted evaluation methodology could draw from the rich literature now available in a range of disciplines including social choice, information and uncertainty theory, while the theoretical literature can be enriched through the use of appropriate case studies and best practice lessons. International funding mechanisms such as GEF do undertake programme implementation reviews periodically; such reviews can also inform and enrich the theoretical literature in many of these fields. For instance, case examples of how communities do or do not exhibit group rationality when involved in a donor driven programme can be a key input to social choice literature. In arid areas of Rajasthan, water harvesting initiatives supported by external funders have been most successful when local communities have been mobilised by local NGOs to bear a significant component of the programme cost; in other words, the ability of a community to translate its group decision-making behaviour to actual burden sharing (financial or otherwise) is a requisite to the sustained success of a resource 'wise-use' programme (Rajender Singh, Tarun Bharat Sangh, pers. comm.).

An attempt at harmonisation of these two streams of literature on evaluation methodology and Biosphere Reserves is made in the following paragraphs, drawing from available case studies and personal experience of the authors with regard to the Indian Biosphere Reserve Programme.

THE CASE OF INDIAN BIOSPHERE RESERVES

Biosphere Reserves, as mentioned earlier, are areas of terrestrial and coastal/marine ecosystems or a combination thereof, earmarked for innovative conservation and management (an alternative to the National Park/Wildlife Sanctuary model) and motivated by the framework of UNESCO's Man and Biosphere Programme. Each Biosphere Reserve is intended to fulfil three complementary functions: a conservation function — to preserve genetic resources, species, ecosystems and landscapes; a development function; and a logistic support function — to support demonstration projects, environmental education and so on. Biosphere Reserves are not covered by an international convention, but must meet a set of criteria allowing them to fulfil properly their three functions. A number of Biosphere Reserves simultaneously encompass areas protected under other systems (such as national parks or nature reserves) and other internationally recognised sites such as Ramsar wetland sites.

India launched its own Biosphere Reserve Programme in 1979. Currently, 11 Biosphere Reserves — Nilgiri, Nandadevi, Nokrek, Gulf of Mannar, Manas, Great Nicobar, Sundarban, Dibru-Saikhowa, Simlipal, Dehang Debang and Pachmarhi operate in India. In addition, Namdapha, Valley of Flowers, Thar Desert, Rann of Kutch, Kanha and the North Islands of Andaman have been identified by the Indian Man and Biosphere (MAB) committee as potential sites for BRs.

The extent to which this network of BRs has fulfilled its multiple objectives could be evaluated using a carefully selected set of indicators. We provide below a sample of such

indicators, using available information and insights gained from personal fieldwork. These are by no means exhaustive; rather they are indicative of how a development intervention may be evaluated in a responsive and adaptive way.

Extent of awareness about goals of the programme at various hierarchical levels

Changes in levels of information about programme objectives and implementation at various hierarchical levels would be an important indicator of management capacity and effectiveness. In the context of Biosphere Reserves, such an understanding is, to a great extent, available at international and national levels, but not at the State or local levels. Indeed, the ability of local people to appreciate the objectives of a development intervention is a requisite for their involvement at various levels of planning and implementation. Our experience suggests that people living inside a Biosphere Reserve area rarely have any idea of the objectives of the programme, though people are more conscious of other conservation categories, like National Park, overlapping with a BR area.

Moreover, there is often a different kind of understanding available at the local level that does not get transferred upwards. For example, in the Nandadevi BR, banning of seasonal grazing in the alpine meadows, locally called *bugyals*, inside the BR (core area) has affected traditional livelihoods; at the same time, locals believe that this has reduced the diversity of medicinal herbs, replacing them with extensive growth of a few species — a development not accounted for in plans decided higher up (Hans Raj Negi, pers. comm.).

Incorporation of local management and cultural practices

The degree to which a development intervention incorporates existing management and cultural practices could be an indicator of its responsiveness. The costs imposed on specific

communities as a result of a course of action taken at a large physical (and hierarchical) distance are typically undervalued. In this regard, the Indian Biosphere Reserve Programme seems to have performed poorly as there have been few systematic studies in this area (an ongoing study on Bhotias, a nomadic tribe in Nandadevi BR undertaken by the Wildlife Institute of India is a notable exception). Consequently, development plans have gone haywire; tribes like Shompens, for example, have refused to accept a development model based on improved access to amenities unrelated to their cultural perceptions. Ecotourism plans have similarly missed out the need to merge local cultural practices (represented through performing arts, for example) as a part of the development strategy.

In many cases, locally evolved conservation practices still continue in a limited way. The Bodo tribals in the Manas BR area protect parts of the forest as sacred groves — a practice which harmonises well with the concepts of supply and safety forests. The Bodos also maintain their traditional varieties of crop species (whereas Assamese, Bengali and Nepali settlers in the area have taken to cultivating high yielding varieties), while the Bodo practices still continue. Bhotias of the Nandadevi BR area graze their livestock and collect medicinal herbs from alpine meadows, maintaining an optimum grazing level to ensure a continued supply of herbs. The closure of the core zone of Nandadevi BR to human activities has deprived local communities of their traditional health practices.

There is also significant local knowledge available with fisherfolk all over India. The fisherfolk on Moyar in the Nilgiri BR are able to describe in great detail the time course of siltation and shallowing of the river stream and the consequent changes in fish fauna. However, very little official documentation is available on the aquatic ecosystems of most Indian BRs. Again, herders in Nandadevi BR narrate the changes in the alpine meadows following the grazing ban,

pointing to the disappearance of several medicinal plant species. Such knowledge almost never plays a meaningful role in management plans for Indian BRs.

Enhancement of entitlements

Improved access to a basket of goods and services consistent with livelihood needs indicates the success of the development function of Biosphere Reserves. However, this kind of indicator is to be used with caution when the alternative livelihood activity imposes non-monetised costs on specific communities. Thus, loss of family members due to dependence on a hazardous activity needs to be suitably weighted against additional income generation. In other words, additional incomes, as Sen (2000) argues, need to create an expansion of 'human freedoms' and elimination of 'human unfreedoms'. The 'unfreedoms' are typically imposed by historical disadvantages or ecological vulnerability. The Indian Biosphere Reserves seem to have performed well on the income generation criteria alone but not so much when judged by the costs-imposed criterion.

In income generation activities, the role played by voluntary agencies deserves mention. In the Sundarban BR (SBR) area, a number of NGOs currently operate, most notably the Ramkrishna Mission Lok Shiksha Parishad (RMLSP) and the Tagore Society for Rural Development (TSRD). Both these organisations play a potent role in making people appreciate the development objectives of Sundarban BR. TSRD, for example, has set up handloom weaving and honey processing units in the Sundarban BR area, with a view to providing alternative employment opportunities (alternative to uncontrolled brackish water aquaculture and forest based livelihoods). These units serve an important development function, relieving pressures on forest based occupations and reducing human hazards due to human-wildlife tensions. Similarly, RMLSP works in direct collaboration with the

Sundarban BR directorate to involve local people in the social forestry programme and other eco-development activities. This is a step in favour of merging the conservation and development functions of BRs, though an overwhelming majority of farmers are totally ignorant of such efforts. This leads us to the issue of strengthening extension functions of a BR programme; at the programme level, inadequate attention given to resource based extension activities reduces the impact of the interventions being implemented by the non-governmental sector.

While the Sundarban BR has successfully created income opportunities through agriculture, aquaculture and cottage industries, it has failed to reduce man-tiger conflicts due to continued dependence of the Tiger Reserve fringe population on non timber forest products (NTFPs). In the Sundarbans, about a million people living close to the Project Tiger area have been heavily deprived of access to their traditional resource bases inside the forest areas, due to restrictions imposed by the project. This suggests that income generation schemes have not harmonised well with traditional livelihoods or have been planned on an inadequate scale.

Moreover, human development as measured by access to a bundle of amenities like healthcare, primary education and telecommunication is not seen as an integral part of the development component of the Biosphere Reserve strategy, especially in remote areas of Nokrek and Nandadevi BR.

People-nature conflicts

The degree to which conflicts between a community and its resource catchment zone, defined by livelihood imperatives, are reduced due to a development intervention would be an indicator of its sustainability and effectiveness. On this count, Indian Biosphere Reserves have clearly failed with such conflicts reported from six of them.

Absence of employment options during slack periods has, for example, led to frequent people-tiger conflicts in the Sundarban BR. Sundarbans, the only mangrove habitat with a tiger population, has an interesting ecological history. The British government had settled large numbers of landless people from Midnapore district and the neighbouring state of Orissa, in the area, to maximise revenue earnings from the land. When Project Tiger was launched in 1973 and access to the forest was curtailed, little attention was paid to the biomass needs of the local population and major livelihood activities like NTFP collection were compromised. Prawn fishing gradually became the major livelihood activity but in the absence of genuine alternatives in the slack season, people still entered the forest. Man-tiger conflicts became frequent enough to turn tigers into man-eaters. Man-crocodile conflicts also increased due to over-dependence of local people on fishing. The typical approach to resolving these problems has been to try to change the behaviour of tigers, so that they do not attack humans. Efforts to check the aggression of tigers have included schemes in which tigers are habituated to drink fresh water (based on the view that drinking of salt water is the cause of the unusual aggression of Sundarban tigers). The root solution to the problem lies in tailoring the development functions of the BR programme to create long-term livelihood options for the people affected by these conflicts.

Manas BR also overlaps with a Tiger Reserve area which does not have a buffer zone on its southern periphery. Consequently, man-tiger conflicts are very common, as human habitations abut on restricted areas. Man-crocodile conflicts pose a major problem in Great Nicobar BR as all rivers in the region have significant crocodile populations. Indeed, most Indian BRs have failed to reduce such conflicts because of inadequate integration of its development goals with the conservation goals of the legally conserved areas with which they overlap.

MANAGEMENT PLANS

Legal framework

The extent to which the legal framework in a country harmonises with an intervention is an indicator of its effectiveness. The Indian legal system, for example, recognises National Parks and Wildlife Sanctuaries, but not Biosphere Reserves, as legal entities and thus imposes purely conservation-oriented restrictions on protected areas. Biosphere Reserves frequently overlap with such protected areas and consequently are governed by the relevant laws, which may not be compatible with the BR programme objectives. This leads, for example, to total prohibition of economic activities like grazing in Nandadevi BR, as mentioned earlier, depriving a community of its livelihood and development needs.

Simultaneously, zonation based on short-term calculations has led to severe imbalances in several areas. In the Manas BR, for example, paddy fields and tea estates extend right up to the southern boundary core zone of the designated Tiger Reserve. Till about two decades ago, this area was mostly covered by grasslands and deciduous forests and was inhabited by a few Bodo tribals. Today, refugees from neighbouring Bangladesh have settled in these areas. An area which could have been a natural buffer between the densely populated Brahmaputra Valley and the Tiger Reserve area is now deforested and cultivated.

Inter-agency collaboration

The extent to which various government departments and agencies coordinate among themselves in the implementation of a programme also indicates its effectiveness. The Indian Biosphere Reserve programme seems to have performed inadequately in this regard. Thus, there is a lack of coordination between the Sundarban Development Board (SDB) and the Forest Department on the issue of mangrove plantation

in degraded forest patches around villages in the Biosphere Reserve area. Similarly, in the Gulf of Mannar BR, the key island of Krusadai in the BR core zone is under the control of the Fisheries Department, which is carrying a programme of establishing aquaculture practices. Oyster culturing is also carried out on a commercial scale on the island. In the Manas Biosphere Reserve, a seed farm is functioning in an area of 900 ha in the core zone which used to be prime grassland habitat for several endangered species.

However, there are also instances where successful programmes conceived outside the BR arrangement have been meshed into a BR area. For example, the Joint Forest Management (JFM) programme in West Bengal has been launched in the Sundarban BR in collaboration with the Sundarban Development Board and local NGOs. Forest Protection Committees (FPCs) in the area are now protecting mangrove patches in the barren mudflats and barren intertidal spaces between embankments.

Efficacy of development plans

The efficacy of development plans is an important indicator of the BR programme. BRs, by definition, need to fulfil integrated conservation and development objectives. Whether funds and equipment intended to fulfil the development goals actually enhance capabilities of target groups is the key question here. In general, the funds made available by the MoEF for the BR programme have rarely reached target groups because of a general lack of awareness about the objectives of funding both among the implementors and the target groups. In the Nandadevi BR, the Forest Department was provided with vehicles to prevent illegal poaching, but the vehicles could hardly reach the trouble spots due to the mountainous terrain, and poaching of musk deer and illegal export of musk to neighbouring countries still continues from Pithoragarh area. It is also reported that television and VCR sets meant to screen documentary films

for awareness creation in the area were actually used by local politicians to show commercial films to bag votes in the elections.

There are other examples of misplaced priorities. Bhotias, the local shepherds in the Nandadevi BR, were randomly provided with fuel efficient *chullahs* which would consume less wood and check deforestation. However, the local people of the area found these of hardly any use; since they needed big fires to tackle the severe cold, which these *chullahs* could not provide. In the Sundarban BR too, the experiment with fuel efficient *chullahs* largely failed because the local people were given practically no training on how to use them and ultimately, the *chullah* chimneys came to be used as farm implements.

Scientific research

Capacity building and demonstration objectives of Biosphere Reserves may be evaluated through the extent of ongoing scientific research. The Indian Biosphere Reserves have performed fairly well in this regard, when each Reserve is taken separately. However, there has been no attempt to create an integrated information system for the entire network. Also, while major biological or socio-economic studies are going on in many of the BRs, multifaceted research integrating ecological, social and management imperatives seem to be lacking except in the Nilgiri BR where the Kerala Forest Research Institute (KFRI) and the Indian Institute of Science, Bangalore have an active research presence.

Outer links — interaction with the larger economy

BRs should aim at developing systems that enhance positive interactions with the larger economy. A significant area of such interaction is the development of good information on medicinal plant resources. However, Central Institutes entrusted with this job (such as the Central Institute of Medicinal and Aromatic Plants) seem to have no interaction with BR authorities.

The Forest Departments too, normally have very scanty information about these resources, and the only source of information is possibly the local collectors. With no mechanism to involve these local people in managing these bioresources, the present trends clearly support the short-term profit making behaviour of commercial interests. In Gulf of Mannar BR, the fishing trawlers from outside countries exploit more fishes in lesser time. Also several demand driven activities like pearl fishing, and export of white and black sea cucumbers as a food delicacy to Southeast Asian countries continues. Similarly, exploitation of seafood like crabs and lobsters continues to supply the demand from countries like Japan.

Negative environmental impacts of activities dictated by the external economy need to be tackled under the BR programme. In the Sundarban BR, for instance, the local people collect prawn in juvenile stages for aquaculture. In the process, other small fish and crustaceans are incidentally destroyed. Furthermore, ponds constructed to store the prawn seeds breach the embankments which are essential for keeping out saline water from the cultivated land. No government agency has so far paid attention to the issue, although a few local NGOs have expressed concern. The basis of BR management needs to be broadened to address these issues.

A related issue is the extent to which BRs create new conflicts or alleviate or accentuate existing conflicts among resource users. In the Manas BR, for instance, a state sponsored seed farm exists in the core zone. This farm largely employs urban people and caters to the demands of urban centres in the Brahmaputra Valley. The local Bodo tribals who live on the fringes are left out of the process, resulting in insurgent tendencies.

Similarly, in Nandadevi BR, excessive tourist traffic around pilgrimage areas creates great pressure on local resources like fuelwood and generates large amounts of solid waste. However,

a summary ban on trekking in the core area has hampered the local economy. In this situation, carefully planned ecotourism or ecotrekking could be organised rather than going for a summary ban on trekking, while allowing uncontrolled pilgrim traffic.

RESPONSIVE INDICATORS

A robust programme level evaluation of the Biosphere Reserve Strategy calls for more information with regard to a much wider set of scientific indicators. However, our snapshot view suggests that the system of indicators should be responsive enough to address specific concerns of ecologically handicapped communities such as those facing major conflicts with wildlife.

The following issues could dictate the choice of indicator methodology:

a) Indicators need to be discriminatory at stress and response level, alternatively in the baseline and project scenarios. Ecosystems are subject to varied amounts of stress based on a range of social and ecological factors. For instance, much of the Sundarban BR area was historically subject to severe population pressures due to settlements driven by a revenue-maximising policy adopted by the British government. An indicator of capabilities should be sensitive (discriminatory) to stresses of this kind. It should be able to assess whether the BR strategy has been able to address this specific local condition. As we have mentioned, judging by this criterion, Sundarban BR has failed to reduce man-wildlife conflicts in the area due to lack of employment alternatives (in the slack season) even though statistics of overall employment creation for Sundarban BR give a favourable picture.

b) Development interventions need to improve access to an appropriate resource bundle sustainably across communities. Thus, indicators are to be community- (or user group-) specific rather than aggregative when dealing with

resource access. Special attention should be paid to ecologically or socially disadvantaged groups. Local shepherds in the Nandadevi BR are a case in point. These people traditionally depend on their livestock for their livelihood. Collection of medicinal herbs is a secondary activity. They live in a relatively closed society with limited external links. An intervention that aims at meeting a broader conservation objective needs to carefully address community needs such as alternative livelihoods. Our indicator should necessarily disaggregate these communities and their needs. In this case, the intervention — banning of grazing — failed not just in addressing the local livelihood issue but also in taking into account local ecological understanding. For instance, moderate level of grazing maintains herb diversity and contributes to local medicinal practices.

c) Participatory process documentation built into a project implementation plan could generate valuable information on local conflict resolution, innovative cultural practices, etc. Indicators could assess impact of interventions on these issues. It is common for development projects to be planned from above and evaluated from above. Even indices for participation in the project are calculated through limited appraisal exercises planned at higher official levels. What is needed is an in-built Monitoring and Evaluation strategy where local people would be able to continually evaluate the development intervention through participatory processes. Biodiversity Registers could be a possible tool for this. Local people could be involved by teams of local college/school teachers and students or local NGOs in a participatory documentation exercise regarding status of biodiversity, management practices, development aspirations, etc. This process could be repeated for a set of indicators periodically to assess project performance.

The major challenge becomes the use of an adaptive evaluation methodology sensitive to the proximate concerns of stakeholder groups.

The typical logical framework adopted by the World Bank and other donor agencies often misses out an analysis of the appropriate disaggregation level (See Table 1). This paper suggests a modified frame incorporating this need, which should lead to a more responsive evaluation of funding efficacy.

LESSONS LEARNT

Biosphere Reserves are eminently suited to fulfil our obligations under the Convention on Biological Diversity which stresses on conservation and sustainable use of biodiversity and equitable sharing of the benefits flowing therefrom. Biosphere Reserve, as a model for conservation and development, is undoubtedly a viable alternative to the protected area based approach which stresses conservation at the expense of livelihood options of people. However, as our study shows, the BR model needs to overcome several difficulties if it has to be effectively applied. On the one hand, it needs to be integrated with various regional planning processes; on the other, the implementers need to clearly understand its objectives and percolate these down to target groups.

The emergent possibilities in the field of biotechnology have made scientific research and good information management all the more important. As we mentioned earlier, while individual BRs have taken up isolated research programmes, there is no attempt to organise resource data at higher levels. In Costa Rica, for example, the INBIO institution is engaged in fulltime screening of biodiversity of the country's forests and Japan has set up an institute for marine biodiversity prospecting in Micronesia. India is rich in traditional use-related knowledge of various medicinal plants and similar activities ought to be organised as part of the BR programme to take advantage of its megadiversity status.

Promotion of the involvement of local people in management of BRs ought to be

another thrust area. As we have mentioned, local people often have a strong ecological perspective on issues like grazing of livestock; this is not accounted for in plans decided by higher officials. Conflicts on resource use, as between Bodos and urban people in Manas BR, need to be carefully addressed in BR plans. For instance, the creation of the Orinoco-Casiquiare BR in Venezuela, covering 83,000 sq. km of rainforest area was a response to concerns of Yanomani and Wekuana tribals regarding development of the area by outside interests. The presidential decree that established this BR states measures to protect the traditional livelihoods of the tribal communities and acknowledges their land ownership rights. The decree also prohibits any colonisation of the area or any other interventions that violate the rights of the communities (<http://nativenet.uthscsa.edu/archive/nl/91b/0307.html>).

Currently, 356 BRs are designated in 90 countries as part of the international network of BRs. However, participation of a BR in the network is voluntary. Only three out of India's eleven BRs are currently official members of the network. Such networking would be crucial to fulfil the logistic support role of BRs.

The Global Environment Facility with a \$2.75 billion replenishment in 1998 is currently emerging as the major funding mechanism for biodiversity. Funding from UNESCO's regular programme has progressively decreased over the years, reaching a modest amount of \$300,000 in 1995. The GEF, on the other hand, allocated \$600 million to biodiversity during its first (post-pilot) phase (1994-97). The GEF is progressively stressing on funding integrated conservation-development projects as opposed to those based on protected areas. The present funding climate thus favours a renewed interest in the BR model. BR projects thus need to be streamlined to meet the emerging funding criteria and the BR philosophy needs to be embedded in country priorities.

Table 1: Sample logframe for performance evaluation of Biosphere Reserves

Indicator	Class	Dataset/method	Discrimination level*	Performance
Changes in information level	Management capacity	Official records, workplans,	International, national, interviews	Poor by discriminatory local criteria
Incorporation of local practices	Responsiveness	Scientific publications, local knowledge	Specific communities; Specific cultural practices	Poor by discriminatory criteria
Enhancement of entitlements	Resource access	Employment/income data, local knowledge	Specific communities; Bundle of basic amenities	Good in terms of income generation alone, poor by discriminatory criteria
Man-nature conflicts	Resource access	Field reports	Ecologically handicapped groups**	Six of the eight BRs report conflicts
Management plans	Management capacity	Policy papers, work plans	Applicability to community needs	Poor at legal and implementation levels
Scientific research	Capacity-building/ demonstration	Publications, field data	Country, individual BR; research components	Good at BR level, poor at higher levels

* World Bank methodology does not include this in the typical logframe. An appropriate level of disaggregation is often crucial in the interpretation of an indicator.

** Groups exposed to ecological hazards in pursuit of livelihood activities, e.g. a community living on the fringe of a Tiger Reserve and relying on collections from within it.

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